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<p>A microcomputer-based expert system to be used in managing federal contract changes was found to be both necessary as indicated by potential user comments, and feasible within the realm of current expert system software shells. The knowledge domain of contract changes was determined to be sufficiently structured and defined to support a floppy disk sized expert system which would not require supplementary manuals as documentation. A demonstration system was developed to test the available system shells and a description of a wider system which would address additional contracting areas was discussed. Development of a functional system presently awaits assignment of additional resources.</p> <p>Keywords:</p>				
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NAME OF CONTRACTOR:

RAMP CORPORATION

BUSINESS ADDRESS:

16771 NE 80th St., #204
Redmond, WA 98052

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Microcomputer Expert
System for Federal
Contract Management

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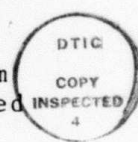
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EXECUTIVE SUMMARY

RAMP Corporation has established the feasibility of applying microcomputer based "Expert System" technology to develop a user friendly management support tool for federal contract administrators. The knowledge domain chosen for the feasibility study was the determination of contract changes. The study task outputs indicated:

- a) That a need for this specific kind of management tool exists within the organizations which are parties to federal contracts, and that this includes a perception of potential productivity enhancements and cost savings from such a system;
- b) That the contract change area was sufficiently specific to be amenable to knowledge domain definition and manipulation within a microcomputer expert system environment;
- c) That existing expert system microcomputer software shells met the requirements for capturing the expert knowledge and presenting it to the system user in an immediately useful manner;
- d) That the regulations and knowledge in the FAR and DFAR were such that they could be incorporated into the knowledge base both as content to be formatted as expert system rules, and as referential materials to illustrate the expert system rules, thereby meeting the desire that the expert system fulfill a training function;
- e) That a prototype "breadboard" system was developed as a means of judging expert system shells and the knowledge base structure that would be required in the development of a full capability system;
- f) That review, test and adjustment of the prototype system indicated no major problem with the system, but triggered an immediate series of suggestions for expanding the system past the domain of contract changes, as well as a set of recommendations for formatting the user interface for maximum efficiency;
- g) That all indications are that development of a full capability should be funded without delay, as return on investment through productivity enhancement and decreasing disputes was seen as a major and immediate benefit.

This final report marks the completion of SBIR Phase I funded activity under DARPA Contract DAAH01-87-C-0767. An alternative source of funding is sought to pursue development of



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A-1	

the full capability system described in the remainder of the report.

2.0 INTRODUCTION

This Final Report marks the completion of all tasks of the contracted effort. Completed activities are described on a task by task basis. The project has met its goals in demonstrating the feasibility of developing a microcomputer-based expert system to deal with Federal Contract Management in the area of contract changes. A prototype "breadboard" expert system has been developed and reviewed for appropriateness as a contract management support tool. Full development of the system now requires further funding.

2.1 TASK SUMMARIES

2.1.1 TASK 1 - VERIFY USER REQUIREMENTS

Verification of user requirements was accomplished by interviews with a wide range of personnel using the questionnaire enclosed as Appendix B to this report.

The following list provides illustrative examples of those commenting on the expert system concept which was the subject of this feasibility study.

POSITION

FIRM/AGENCY

Manager of Purchasing	Commercial Firm
Procurement Specialist	Federal Dept. of Justice
Technical Project Manager	Defense Department Contractor
Contr. Officer Tech. Represent.	Naval Electronics System Cmd.
Contracting Officer	National Bureau of Standards
Branch Chief	Small Business Administration
Admin.Contracting Officer	DCASMA

Confirmation of user needs has been made by discussions with contract-related personnel both inside and outside the Government. The proposed system has been validated by those reached in the area of Contract Changes. It was generally agreed that the basic concept was well-founded, and that mutual identification of contract change conditions would assist both parties to a contract by reducing the potential for disputes and subsequent litigation.

Substantial interest was shown in aspects of contract management beyond the area of Contract Changes, such as pricing of additional work and identification of costing impacts on potential contract changes. The ability of the program to expand and accept enhancements was often indicated to be important. It was felt that the program should be able to interrogate other computer files such as spreadsheets and data base management systems for data required by the expert system. These issues were given strong consideration in the establishment of the system requirements.

Most interviewees were very eager to exploit any training capabilities which the system could incorporate and asked that substantial amounts of referential materials from the FAR and DFAR be made part of the knowledge base. It was felt that proper citations for the references would make them useful no matter how or under what conditions the system was being interrogated.

The necessity of periodic updates to the system was usually identified. Annual upgrades for a nominal cost to registered users was suggested as a mechanism requiring a long-term commitment to system support from the developer. This long-term potential is one major reason to provide adequate technical resources to the system during its development. The developer must choose system architecture which will be sufficient for a long period of time with many updates possible.

2.1.2 TASK 2 - REVIEW AVAILABLE MICROBASED EXPERT SYSTEMS

Advantage was taken of the occurrence of the 1987 meeting of the American Association of Artificial Intelligence in Seattle, Washington to contact the developers of virtually all the available expert system shells. Discussions with the vendors and examination of available shells allowed the narrowing of the choices deemed suitable for the proposed application.

Features which became important for the proposed application were:

a) Availability of a system of weighting conclusions by combining weighing from individual rules. In the contract management area, some rules may be categorized as usually true, often true, or occasionally true. This kind of "fuzzy" thinking needs to be preserved in the expert system and an appropriate weighting procedure became a major necessity.

A number of self-generating systems were reviewed. These systems require input of conditions and results which the system then uses to generate its operating rules. These systems do not provide for the weighting of conclusions that seems is required by our knowledge domain. Contract changes are usually multi-dimensional in scope and content. A simple cause and effect approach used by self-generating systems does not allow for the "fuzziness" of the contracting area.

b) Internal documentation for system operation. In order to reduce the amount of time required for the system to start helping the user, it was desired that internal documentation in the form of directions for operation, "help" screens, and so forth be available. To expedite user familiarity, complete avoidance of a written documentation manual was desired.

c) A capacity for linking the system to external databases and files was deemed critical to the eventual success of a comprehensive expert system in the contract management area. Projection of such mass storage applications as CD ROM (compact

disc, read only memory) leads us to believe that the user of the expert system might eventually wish to have the capability to interrogate the entire FAR/DFAR and Appeals Board Decisions under the guidance of the expert system by a text search algorithm. The system needs to have the capability for external data calls right from the beginning.

d) A non-copy protected "run-time" system was required to provide maximum flexibility in the hands of the user. Since the delivered system will not be amenable to user modification, copy protection would be of limited importance. By allowing the user to copy the system to hard discs and so on, its use will become more widespread with concomitant benefits for the entire user community. The dynamic nature of the contemporary knowledge base will require periodic updates to the expert system which provides the continuing motivation for further development of the system. Elimination of copy protection would provide a wider exposure for the program and enhance both the potential customer base and the overall return in productivity enhancement.

e) An ability to allow the system to exhibit how it is working as an interaction proceeds. As the user works the system he will want to know why a question is being asked. By querying the system and it's operation, the user will provide more insightful input. Also such capability is required to allow efficient modification and enhancement of the system in response to changes in the FAR and decisions made by Contract Boards of Appeals. The knowledge base to be applied is a dynamic one and changes are inevitable of both major and minor proportions.

Demonstration systems were obtained from major expert system shell developers and reviewed for ease of operation and for compliance with the requirements given above. A subset of the available systems were found to exhibit many of the requirements discussed above and were selected for manipulation and further test:

<u>EXPERT SYSTEM NAME</u>	<u>DEVELOPER</u>
SUPER EXPERT	SOFTSYNC 162 Madison Avenue New York, NY 10016
1ST. CLASS	PROGRAMS IN MOTION, INC. 10 Sycamore Road Wayland, MA 01778
KNOWLEDGE PRO	KNOWLEDGE GARDEN, INC. 473A Malden Bridge Road, RD #2 Nassau, NY 12123
EXSYS	EXSYS, INC. P.O.Box 75158, Contr. Sta.14 Albuquerque, NM 87194

2.1.3 TASK 3 - SYSTEM SELECTION AND FAMILIARIZATION

A small prototype system of approximately 20 rules was developed on paper and then installed within the expert system shells listed above. Since it is not intended that the user modify or enhance the production system, the ease of rule installation was not a criteria for selection of the expert system shell chosen for final implementation.

As a result of this exercise, EXSYS was chosen for implementation of the "breadboard" prototype. EXSYS met or exceeded all selection criteria and has continued to increase its capabilities through a series of upgrades of the expert system shell by the developer.

2.1.4 TASK 4 - STRUCTURE FAR/CONTRACT CHANGE KNOWLEDGE BASE

Efforts on this task were undertaken to support development of the prototype system used in Tasks 3 and 5. Additional effort was expended in the development of the Contract Change Knowledge Base. Current FAR and DFAR documents were analyzed for referential materials which supported and illustrated the expert system rules or which needed to be represented directly as rules themselves.

Certain parts of Part 43: Contract Modifications and 52.243-(1-7): Solicitation Provisions and Contract Clauses - Changes of the FAR suggested additional rules, as well as provided referential information which was used in an explanatory manner within the expert system.

Pathways into other areas of contract management were suggested by the FAR itself from its own internal referencing. Some of these pathways are represented in the relationships depicted in Figure 3.1. The breadboard "Change" system was always considered in the context of the wider concerns shown in the figure. The "Change" system is seen as a cornerstone module with direct connections to related modules, each drawing information from common datasets as shown.

2.1.5 TASK 5 - DEVELOP CONTRACT CHANGE APPLICATION OF EXPERT SYSTEM

Attached as Appendix A is a printing of the expert system "breadboard" as developed for this contract. The system is viewed as being in a "proof-of-concept" state and is not in any manner to be considered as a viable product to be applied to contract management decision making. The system, as presently

structured, exhibits the characteristics and capabilities established in Task 2.

2.1.6 TASK 6 - TEST AND ADJUSTMENT OF APPLICATION

Review of the prototype system has been limited given the time available and the limited size of the prototype system. Major concerns dealt with the "rough edges" of the prototype. No comments were received that questioned the value of the system under study. Adjustments to the system were made in response to the comments, but an effort was not made to produce a functional system at this stage.

Attention was focused by the reviewers at structuring the rules and their employment so that users were always faced with substantive queries for information, and not asked to provide data which would ultimately prove not useful to the system. Much of this requirement is met by a proper ordering of the rules so that they pare away the unfruitful lines of inquiry as early as possible.

It is recognized that a fully developed system will pass through a lengthy period of testing and adjustment. During this time, unanticipated lines of inquiry or the inability of the system to accept novel and unique responses will be identified. Expert systems are different from other computer programs in that they attempt to mimic human knowledge which is often less than cohesive and coherent, even though it is generally logical.

2.1.7 TASK 7 - PHASE I FINAL REPORT

This document is the Final Report prepared under this contract.

3.0 DEMONSTRATION PROTOTYPE

The demonstration prototype has garnered the nickname "CLAIMJUMPER" R , since determination of a contract change can be the first step in a series leading to a contract claim.

The system is straightforward with a maximum of three levels of hierarchy in the logical chain which results in a conclusion. The intent was to demonstrate the appropriateness of the expert system shell chosen, and to experiment in applying the requirements selected in Tasks 2 and 3. The current version is not ready for application to ongoing contracting situations since exploration was the goal, rather than contracting solutions.

Appendix A provides a listing of the *** rules which make up the demonstration prototype. Each rule has the capacity to carry with it illustrative material in the form of NOTES, which are displayed automatically as the rule is being invoked, and REFERENCES, which are displayed upon request by the user.

The current order in which the rules are invoked has not been optimized. Development of a production system would place heavy emphasis on the path taken through the rules to provide for efficiency in querying the system, and for avoiding unnecessary questioning.

The size of the demonstration system is such that it presently occupies only 11% of a double-sided floppy disk. Thus there is ample room to expand the system and still maintain a floppy disk format. If the system is ultimately expanded to cover areas of contract management new areas can be put onto individual floppies. Transfer to a hard disk will always be an option of the user.

4.0 FUTURE WORK

All results of this feasibility study indicate that full-scale development of a comprehensive contract change identification expert system is justified. Such an effort would add to the current project team ancillary personnel with specific experience in the federal contracting area. The "breadboard" prototype system provides a textbook approach to the knowledge domain. It addresses the classic and major questions encountered. The full-scale system must increase the breadth of referential materials available. It must also prepare the "CHANGE-module" to guide the user toward other modules required to execute processes required by contract changes.

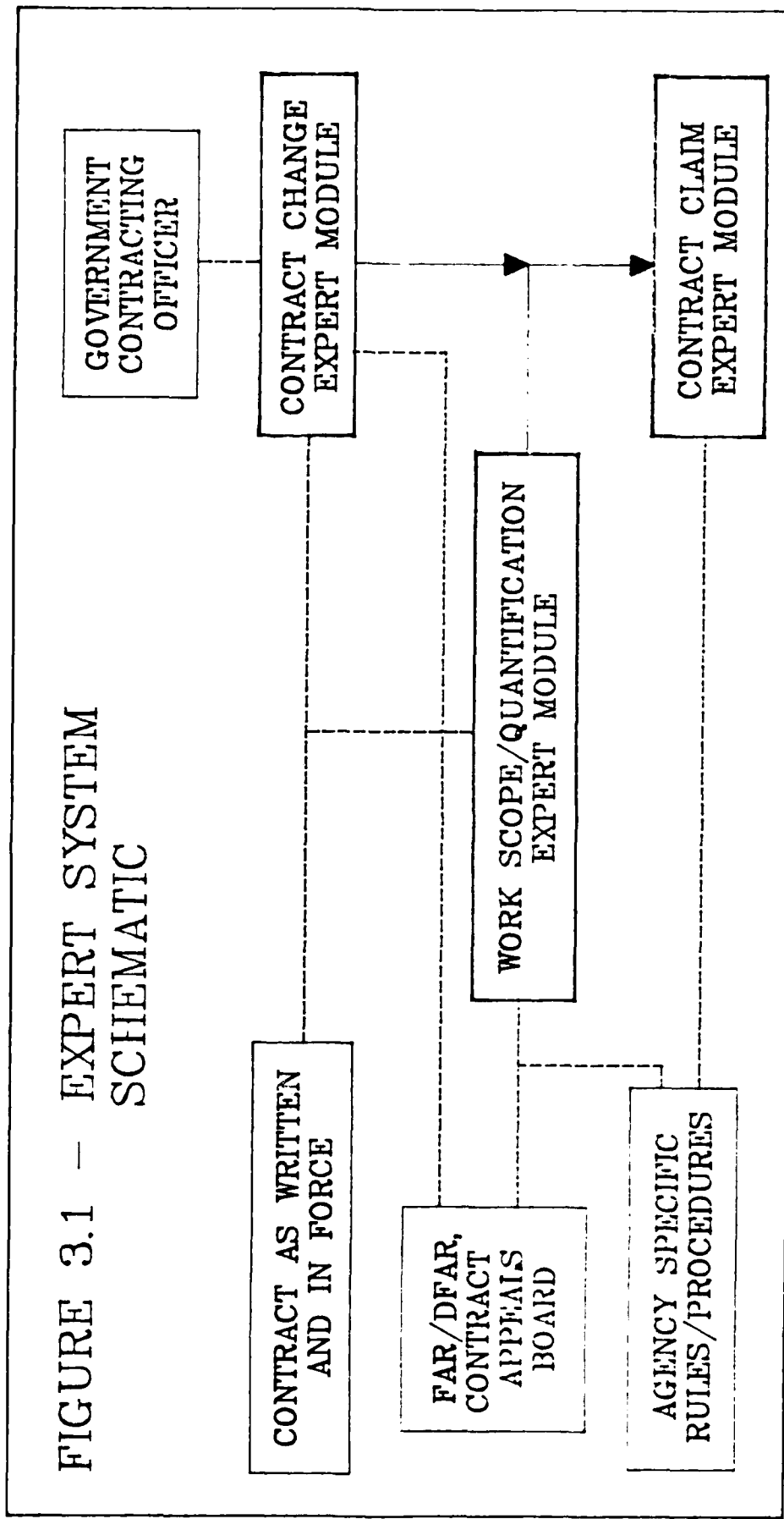
Development of the full system must be done from a wider perspective. While contract changes can form the central foundation, the architecture of a final product must provide for the connections between related aspects of the contract management process. Once having identified the existence of a change, the system must proceed to advise on the proper methods and schedule for timely notification of the contracting officer, compose a supplemental agreement and prepare for the negotiation of an equitable adjustment. An entirely separate but associated knowledge domain must be conceptualized which will assist in the

quantification and costing of work efforts, guide the establishment an accounting procedure which will meet the requirements of the Change Order Accounting Clause.

Figure 3.1 provides a visual of the expanded concept which resulted from the input of the users and reviewers. The connections between the modules are schematic rather than inherent in the software. Each module is a stand alone application of the expert system in a particular area. This is so that individual floppy disks can be used for each module and provide for the widest adaptability to both single and dual floppy disk personal computers. The user decides which module to exercise, which could be in the order suggested by the schematic flow connections. Dotted connections indicate a knowledge or information connection showing the basis for the rules within each expert system module.

The expansion of the architecture will require the addition of cost accounting standard and scope of work specialists to the present project team, as well as require input from contracting legal experts who can bring the results of appeals board decisions to bear on the areas under study.

FIGURE 3.1 — EXPERT SYSTEM SCHEMATIC



APPENDIX A - EXPERT SYSTEM RULES

LICENSE RIGHTS LEGEND

CONTRACT NO. - DAAH01-87-C-0767

CONTRACTOR - RAMP CORPORATION, REDMOND, WA

For a period of two (2) years after the delivery and acceptance of the deliverable items under this contract, this technical data (Appendix A - Expert System Rules) shall not, without written permission of the above Contractor, be either (A) used, released or disclosed in whole or in part outside the Government, (B) used in whole or in part by the Government for manufacture, or (C) used by a party other than the Government. After the expiration of the two (2) year period, the Government may use, duplicate, or disclose the data, in whole or in part and in any manner, for Government purposes only, and may have or permit others to do so for Government purposes only. All rights to use or duplicate the data for commercial purposes are retained by the Contractor, and others to whom this data may be disclosed agree to abide by this commercial purposes limitation. The Government assumes no liability for use or disclosure of the data by others for commercial purposes. This legend shall be included on any reproduction of this data, in whole or in part.

Subject:
FEDERAL CONTRACT CHANGES

Author:
RODERICK A. CARR
RAMP CORPORATION
(c)1986,1987

Starting text:

CLAIMJUMPER is a microcomputer-based knowledge system. It will assist both parties to a Federal Contract in determining if an event has caused a contract change. The system uses a scale of 0-10 to express the confidence it has in its conclusions. High confidence is represented by a 10.

The identification and description of contract changes rests upon guidance available in the Federal Acquisition Regulations (FAR) and upon the interpretations of various Contract Boards of Appeals. These reference materials appear with the individual rules which make up CLAIMJUMPER'S expert knowledge. The user need only view the "Reference" part of any rule to discover a citation for the rule and its basis.

DISCLAIMER RAMP CORPORATION makes no representation or warranties with respect to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any purpose. Further, RAMP reserves the right to revise this product and to make changes from time to time in the content hereof without obligation of RAMP CORPORATION to notify any person or organization of any revision or changes.

Ending text:

As a result of the information that you have provided, CLAIMJUMPER has reached conclusions concerning the likelihood that a contract change has occurred. The kinds of changes are listed in descending order of certainty.

Remember, do not take substantive contracting actions based only on the advice of CLAIMJUMPER. Utilize all your available legal and business resources to make carefully justified and documented decisions. CLAIMJUMPER can be a valuable adjunct to your decisionmaking, but should not be allowed to deal with your specific situation with total disregard for other advice and/or information.

Uses all applicable rules in data derivations.

RULE NUMBER: 1

IF: THE SITUATION DEMONSTRATES INCORRECT INTERPRETATION OF SPECIFICATIONS
BY THE GOVERNMENT

THEN: THE EVENT DEMONSTRATES INCORRECT INTERPRETATION OF SPECIFICATIONS BY
THE GOVERNMENT

NOTE:
/01/87-RAC

REFERENCE:
HG&A CHANGE COURSE MATERIALS (1985)

RULE NUMBER: 2

IF: THE SITUATION DEMONSTRATES SPECIFICATIONS WHICH CALL FOR PERFORMANCE
WHICH CAN NEITHER ACTUALLY OR PRACTICALLY BE ATTAINED

THEN: THE EVENT DEMONSTRATES IMPOSSIBLE SPECIFICATIONS

NOTE:
/01/87-RAC

REFERENCE:
HG&A CHANGE COURSE MATERIALS (1985)

RULE NUMBER: 3

F: THE SITUATION DEMONSTRATES DEFECTS IN THE DETAILED INFORMATION
FURNISHED IN THE DRAWINGS OR SPECIFICATIONS

HEN: THE EVENT DEMONSTRATES DEFECTIVE SPECIFICATIONS

NOTE:
/01/87-RAC

REFERENCE:
HQ&A CHANGE COURSE MATERIALS (1985)

RULE NUMBER: 4

F: THE SITUATION REPRESENTS AN ACTUAL IMPOSSIBILITY OF MEETING CONTRACT
SPECIFICATIONS

HEN: THE EVENT DEMONSTRATES IMPOSSIBLE SPECIFICATIONS

NOTE:
/01/87-RAC

REFERENCE:
HQ&A CHANGE COURSE MATERIALS (1985)

RULE NUMBER: 5

IF:
THE SITUATION REPRESENTS A PRACTICAL IMPOSSIBILITY OF MEETING CONTRACT SPECIFICATIONS

THEN:
THE EVENT DEMONSTRATES IMPOSSIBLE SPECIFICATIONS

NOTE:
5/01/87-RAC

REFERENCE:
JHG&A CHANGE COURSE MATERIALS (1985)

RULE NUMBER: 6

IF:
THE EVENT OCCURS BEFORE THE CONTRACT IS SIGNED

THEN:
THE EVENT OCCURS WHILE THE CONTRACT IS NOT IN FORCE

NOTE:
5/1/87 - RAC THE CONTENT OF CARDINAL CHANGES MAY ULTIMATELY PROVE MUTUALLY BENEFICIAL TO BOTH PARTIES TO THE CONTRACT. CAREFUL CONSIDERATION SHOULD BE GIVEN TO THE NEEDS OF THE GOVERNMENT AND THE CAPABILITIES OF THE CONTRACTOR, RATHER THAN OUT OF HAND REJECTION OF CARDINAL CHANGE REQUESTS.

RULE NUMBER: 7

IF:
THE EVENT OCCURS AFTER THE CONTRACT IS SIGNED, BUT BEFORE FINAL PAYMENT
HAS BEEN MADE

THEN:
THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE

NOTE:
7/1/67 - RAC

RULE NUMBER: 8

IF:
THE EVENT OCCURS AFTER FINAL PAYMENT HAS BEEN MADE

THEN:
THE EVENT OCCURS WHILE THE CONTRACT IS NOT IN FORCE

NOTE:
6/1/67 - RAC

RULE NUMBER: 9

IF:

THE EVENT CONCERNS DRAWINGS, DESIGNS OR SPECIFICATIONS
and THE EVENT OCCURS AFTER THE CONTRACT IS SIGNED, BUT BEFORE FINAL PAYMENT
HAS BEEN MADE
and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL
SCOPE OF THE ORIGINAL CONTRACT
and THE CONTRACTOR IS NOTIFIED OF THE EVENT IN WRITING
and THE NOTIFICATION PERIOD HAS NOT BEEN EXCEEDED
and THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES EXIST or MAY EXIST
and THE CONTRACT CONTAINS A STANDARD "CHANGES" CLAUSE IN THE GENERAL
PROVISIONS (SECTION 1.)

THEN:

FILE CONTRACT CLAIM - Probability=9/10
and CONSTRUCTIVE CHANGE - Probability=9/10

NOTE:

6/1/87 - RAC

REFERENCE:

THIS IS THE FIRST ATTEMPT AT THE BIG RULE WHICH PULLS TOGETHER ALL THE
DIFFERENT MUTUALLY OCCURRING ACTIONS WHICH MUST SUPPORT A CONTRACT
CHANGE.

RULE NUMBER: 10

IF:

THE TITLE OF THE PERSON WHO NOTIFIED YOU WAS ADMINISTRATIVE CONTRACTING
OFFICER or TERMINATING CONTRACTING OFFICER or PRINCIPAL OR PROCURING
CONTRACTING OFFICER

THEN:

THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES EXIST

NOTE:

5/26/87 - RAC

RULE NUMBER: 11

IF:
THE TITLE OF THE PERSON WHO NOTIFIED YOU WAS CONTRACTING OFFICER'S
TECHNICAL REPRESENTATIVE (COTR) or CONTRACTING OFFICER'S
REPRESENTATIVE (COR)

THEN:
THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE MAY EXIST

NOTE:
6/1/87 - RAC

RULE NUMBER: 12

IF:
THE EVENT OCCURED MORE THAN 20 DAYS AGO

THEN:
THE NOTIFICATION PERIOD HAS BEEN EXCEEDED

ELSE:
THE NOTIFICATION PERIOD HAS NOT BEEN EXCEEDED

NOTE:
5/29/87 - RAC EVEN THOUGH THE PERIOD FOR WRITTEN NOTIFICATION OF THE
EVENT HAS PASSED, IMMEDIATELY COMMUNICATE WITH THE CONTRACTING
OFFICER. OFTEN, THIS REQUIREMENT HAS BEEN SUBORDINATED IN THE ACTUAL
OPERATION OF THE CONTRACT MANAGEMENT PROCESS IN RECOGNITION OF THE
DIFFICULTY WHICH ARISES IN ESTABLISHING THE OCCURENCE OF A
CONSTRUCTIVE CHANGE IN COMPLEX SITUATIONS.

RULE NUMBER: 13

IF:

THE ADDITIONAL WORK IS FAIRLY AND REASONABLY WITHIN THE CONTEMPLATION OF THE PARTIES WHEN THE CONTRACT WAS ENTERED INTO or AN INSEPARABLE PART OF THE ORIGINAL WORK or CLOSELY RELATED TO THE ORIGINAL WORK or A LIMITED CHANGE IN THE AMOUNT OF THE ORIGINAL WORK

THEN:

THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL SCOPE OF THE ORIGINAL CONTRACT

ELSE:

THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE OUTSIDE THE GENERAL SCOPE OF THE ORIGINAL CONTRACT

NOTE:

6/1/87-RAC First rule using qualifiers in the then part.

REFERENCE:

Keeco Industries, Inc. vs United States, 176 Ct.Cl. 983, 364 F.2d 838 (1966) The change is outside of the scope of work if consideration of both the magnitude and the quality of the change leads to the conclusion that the original purpose of the contract had been substantially changed.

Federal Aviation Agency
Procurement Manual (1966) The words "general scope of the contract" limit changes to those that do not alter the basic nature of the procurement. The change must be reasonable in amount or extent and consistent with the original intent of the parties. A proposed change does not fall outside of the "Changes" clause unless it changes the basic nature of the procurement. The words "general scope of the contract" are not the same nor do they mean the same as "scope of work". A change in the specifications will change the "scope of work" but may or not may not be within the "general scope."

RULE NUMBER: 14

IF: THE NOTIFICATION METHOD IS IN WRITING or VERBAL or BY SELF-DISCOVERY

THEN: THE NOTIFICATION IS PROPER

ELSE: THE NOTIFICATION IS IMPROPER

NOTE:
6/1/87 - RAC

REFERENCE:
***** WE NEED TO DISCRIMINATE IN THE ASSIGNMENT OF PROBABILITIES
BETWEEN THE DIFFERENT WAYS OF RECEIVING OR ESTABLISHING NOTIFICATION.

RULE NUMBER: 15

IF: THE EVENT OCCURS WHILE THE CONTRACT IS NOT IN FORCE

THEN: CARDINAL CHANGE - Probability=10/10

NOTE:
6/1/87 - RAC

RULE NUMBER: 16

IF:

THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE
and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE OUTSIDE THE GENERAL
SCOPE OF THE ORIGINAL CONTRACT

THEN:

CARDINAL CHANGE - Probability=10/10

NOTE:

6/1/87 - RAC

RULE NUMBER: 17

IF:

THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE
and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL
SCOPE OF THE ORIGINAL CONTRACT
and THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES NOT EXIST

THEN:

NO CONTRACT CHANGE - Probability=10/10

NOTE:

6/1/87 - RAC

RULE NUMBER: 18

IF:
THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE
and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL
SCOPE OF THE ORIGINAL CONTRACT
and THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES EXIST or MAY EXIST
and THE NOTIFICATION IS IMPROPER

THEN:
NO CONTRACT CHANGE - Probability=8/10

NOTE:
6/1/87 - RAC

REFERENCE:
The means or timing of notification should be carefully considered within the overall context of the contract effort. An administrative error should not be given undue precedence which inhibits the effective accomplishment of the contractual goals. 8/31/87 - RAC

RULE NUMBER: 19

IF:
THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE
and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL
SCOPE OF THE ORIGINAL CONTRACT
and THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES EXIST or MAY EXIST
and THE NOTIFICATION IS PROPER
and THE CONTRACT CONTAINS A STANDARD "CHANGES" CLAUSE IN THE GENERAL
PROVISIONS (SECTION I.)
and THE EVENT CONCERNS DRAWINGS, DESIGNS OR SPECIFICATIONS or METHOD OF
SHIPMENT OR PACKING or PLACE OF DELIVERY, INSPECTION OR ACCEPTANCE or
DESCRIPTION OF SERVICES TO BE PERFORMED or TIME OF PERFORMANCE or
PLACE OF PERFORMANCE
and THE EVENT IS CAUSED BY A CHANGE IN THE METHOD OR MANNER OF PERFORMANCE
or A DELAY IN THE NOTICE TO PROCEED or DELAY DUE TO A DEFECTIVE
SPECIFICATION or DIFFERING SITE CONDITIONS or CONSTRUCTIVE
ACCELERATION OF WORK or AN ACT OF OMISSION or NONE OF THE ABOVE

THEN:
CONSTRUCTIVE CHANGE - Probability=9/10

NOTE:
6/1/87 - RAC

RULE NUMBER: 20

IF:

- THE EVENT OCCURS WHILE THE CONTRACT IS IN FORCE
- and THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE WITHIN THE GENERAL SCOPE OF THE ORIGINAL CONTRACT
- and THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE DOES EXIST or MAY EXIST
- and THE NOTIFICATION IS IMPROPER
- and THE CONTRACT CONTAINS A STANDARD "CHANGES" CLAUSE IN THE GENERAL PROVISIONS (SECTION I.)
- and THE EVENT CONCERNS DRAWINGS, DESIGNS OR SPECIFICATIONS or METHOD OF SHIPMENT OR PACKING or PLACE OF DELIVERY, INSPECTION OR ACCEPTANCE or DESCRIPTION OF SERVICES TO BE PERFORMED or TIME OF PERFORMANCE or PLACE OF PERFORMANCE
- and THE EVENT IS CAUSED BY A CHANGE IN THE METHOD OR MANNER OF PERFORMANCE or A DELAY IN THE NOTICE TO PROCEED or DELAY DUE TO A DEFECTIVE SPECIFICATION or DIFFERING SITE CONDITIONS or CONSTRUCTIVE ACCELERATION OF WORK or AN ACT OF OMISSION or NONE OF THE ABOVE

THEN:

CONSTRUCTIVE CHANGE - Probability=3/10

NOTE:

6/1/87 - RAC

REFERENCE:

The means or timing of notification should be carefully considered within the overall context of the contract effort. An administrative error should not be given undue precedence which inhibits the effective accomplishment of the contractual goals. 8/31/87 - RAC

RULE NUMBER: 21

IF:

THE EVENT IS DISCOVERED BY THE CONTRACTOR

THEN:

THE CONTRACTOR IS NOTIFIED OF THE EVENT BY SELF-DISCOVERY

ELSE:

THE EVENT IS DISCOVERED BY THE GOVERNMENT

NOTE:

6/1/87 - RAC

RULE NUMBER: 22

IF: THE ADDITIONAL WORK IS A LIMITED CHANGE IN THE AMOUNT OF THE ORIGINAL WORK

THEN: THE EVENT CONCERNS DESCRIPTION OF SERVICES TO BE PERFORMED

NOTE:
6/1/87 - RAC

RULE NUMBER: 23

IF: THE EVENT IS THE RESULT OF GOVERNMENT DELAY OF WORK or SUSPENSION OF WORK or INTERRUPTION OF WORK

THEN: NO CONTRACT CHANGE - Probability=9/10

NOTE:
LOOK FOR A "SUSPENSION OF WORK" CLAUSE OR A "GOVERNMENT DELAY OF WORK" CLAUSE IN YOUR CONTRACT. THE CHANGES CLAUSE IS NOT USUALLY APPLICABLE TO THESE KINDS OF DELAYS.

REFERENCE:
NASH (1981)

QUALIFIERS:

1 THE EVENT OCCURS

BEFORE THE CONTRACT IS SIGNED
AFTER THE CONTRACT IS SIGNED, BUT BEFORE FINAL PAYMENT HAS BEEN MADE
AFTER FINAL PAYMENT HAS BEEN MADE

Used in rule(s): 6 7 8 9

2 THE CONTRACT CONTAINS

A STANDARD "CHANGES" CLAUSE IN THE GENERAL PROVISIONS (SECTION I.)
ADDITIONAL "CHANGES" INFORMATION IN THE SPECIAL PROVISIONS (SECTION H.)
PROVISION FOR AN ORDER OF PRECEDENCE AMONG THE VARIOUS CLAUSES AND THE
SPECIFICATIONS.

Used in rule(s): 9 19 20

3 THE EVENT DESCRIBES GOODS AND SERVICES WHICH ARE

OUTSIDE THE GENERAL SCOPE OF THE ORIGINAL CONTRACT
WITHIN THE GENERAL SCOPE OF THE ORIGINAL CONTRACT

Used in rule(s): 9 (13) [13] 15 17 18
 19 20

4 THE CONTRACTOR IS NOTIFIED OF THE EVENT

IN WRITING
VERBALLY
BY SELF-DISCOVERY

Used in rule(s): 9 (21)

5 THE EVENT CONCERNS

DRAWINGS, DESIGNS OR SPECIFICATIONS
METHOD OF SHIPMENT OR PACKING
PLACE OF DELIVERY, INSPECTION OR ACCEPTANCE
DESCRIPTION OF SERVICES TO BE PERFORMED
TIME OF PERFORMANCE
PLACE OF PERFORMANCE

Used in rule(s): 9 19 20 (22)

6 THE EVENT IS CAUSED BY

A CHANGE IN THE METHOD OR MANNER OF PERFORMANCE
A DELAY IN THE NOTICE TO PROCEED
DELAY DUE TO A DEFECTIVE SPECIFICATION
DIFFERING SITE CONDITIONS
CONSTRUCTIVE ACCELERATION OF WORK
AN ACT OF OMISSION
NONE OF THE ABOVE

Used in rule(s): 19 20

7 THE SITUATION REPRESENTS

AN ACTUAL IMPOSSIBILITY OF MEETING CONTRACT SPECIFICATIONS
A PRACTICAL IMPOSSIBILITY OF MEETING CONTRACT SPECIFICATIONS
NEITHER OF THE ABOVE

Used in rule(s): 4 5

8 THE SITUATION DEMONSTRATES

DEFECTS IN THE DETAILED INFORMATION FURNISHED IN THE DRAWINGS OR
SPECIFICATIONS
SPECIFICATIONS WHICH CALL FOR PERFORMANCE WITH CAN NEITHER ACTUALLY OR
PRACTICALLY BE ATTAINED
INCORRECT INTERPRETATION OF SPECIFICATIONS BY THE GOVERNMENT
NO PROBLEM WITH SPECIFICATIONS IS INDICATED

Used in rule(s): 1 2 3

9 THE TITLE OF THE PERSON WHO NOTIFIED YOU WAS

ADMINISTRATIVE CONTRACTING OFFICER
TERMINATING CONTRACTING OFFICER
PRINCIPAL OR PROCURING CONTRACTING OFFICER
CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR)
CONTRACTING OFFICER'S REPRESENTATIVE (COR)

Used in rule(s): 10 11

10 THE EVENT OCCURED

MORE THAN 20 DAYS AGO
LESS THAN 20 DAYS AGO

Used in rule(s): 12

11 THE ADDITIONAL WORK IS

FAIRLY AND REASONABLY WITHIN THE CONTEMPLATION OF THE PARTIES WHEN THE
CONTRACT WAS ENTERED INTO
AN INSEPARABLE PART OF THE ORIGINAL WORK
CLOSELY RELATED TO THE ORIGINAL WORK
A LIMITED CHANGE IN THE AMOUNT OF THE ORIGINAL WORK

Used in rule(s): 13 22

12 THE NOTIFICATION PERIOD HAS

BEEN EXCEEDED
NOT BEEN EXCEEDED

Used in rule(s): 9 (12) [12]

13 THE CONTRACTUAL AUTHORITY TO ORDER A CHANGE

DOES EXIST

MAY EXIST

DOES NOT EXIST

Used in rule(s): 9 (10) (11) 17 18 19
 20

14 THE EVENT OCCURS WHILE

THE CONTRACT IS IN FORCE

THE CONTRACT IS NOT IN FORCE

Used in rule(s): (6) (7) (8) 15 16 17
 18 19 20

15 THE EVENT DEMONSTRATES

DEFECTIVE SPECIFICATIONS

IMPOSSIBLE SPECIFICATIONS

INCORRECT INTERPRETATION OF SPECIFICATIONS BY THE GOVERNMENT

Used in rule(s): (1) (2) (3) (4) (5)

16 THE NOTIFICATION METHOD IS

IN WRITING

VERBAL

BY SELF-DISCOVERY

Used in rule(s): 14

17 THE NOTIFICATION IS

PROPER

IMPROPER

Used in rule(s): (14) [14] 18 19 20

18 THE EVENT IS

DISCOVERED BY THE GOVERNMENT

DISCOVERED BY THE CONTRACTOR

Used in rule(s): 21 [21]

19 THE EVENT IS THE RESULT OF

GOVERNMENT DELAY OF WORK
SUSPENSION OF WORK
INTERRUPTION OF WORK
NONE OF THE ABOVE

Used in rule(s): 23

CHOICES:

1 CARDINAL CHANGE

Used in rule(s): (15) (16)

2 CONSTRUCTIVE CHANGE

Used in rule(s): (9) (19) (20)

3 FILE CONTRACT CLAIM

Used in rule(s): (9)

4 NO CONTRACT CHANGE

Used in rule(s): (17) (18) (23)

APPENDIX B - USER QUESTIONNAIRE

CONTRACT CHANGE SYSTEM QUESTIONNAIRE

5/21/87

NAME _____ DATE _____

MAILING ADDRESS: _____

PHONE: () _____ - _____ POSITION/TITLE: _____

1. What role does Federal Contract management play in your daily activities?

2. How long have you been dealing with Federal Contracts?

3. What types of contracts do you work with? (CPFF, FFP, other?)

3. What is your typical contract work load, e.g. number of contracts operating at any one time?

4. Do you contract for:
 - () GOODS - What kinds?
 - () CONSTRUCTION - What types?
 - () SERVICES - What sorts?

5. What range of contract values is typical for the contracts you deal with?

6. What training have you completed in Contract Management?

7. What computerized software tools do you use in your work?

8. What computer hardware do you have immediate, hands-on access to on a daily basis?

Microcomputer?

Manufacturer

Available Memory?

Dual Floppy/Hard Disk

9. What computer-related training have you completed?

10. Which aspects of Federal Contract Management, i.e. which parts of the contract itself cause you the most trouble and/or reoccur the most often.?

Examples: Government delay of work, contract changes, defining work scope, differing site conditions, changes in amounts of work, defective specifications, etc..

11. What guidance documentation do you use to overcome these troublesome issues?

12. Is there documentation that is specific to the current practices of your agency? *It's title for document identifiers?*

13. Are there computer tools available to assist in overcoming these troublesome issues? What are they?

14. Do you feel that contract management would be improved if both parties to the contract could develop a shared viewpoint of the performance of the effort as it proceeded?

15. Do you feel that your counterpart on the other side of

the table needs additional training to develop a better understanding of contract management? If so, in what specific areas? (See #10 above)